Natural Universe Supergravity Source Power Source and Finite Infinite Order Disorder Chaos Disorder 2025v3.1

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structural evolution and implicit structural evolution.
3. Local and global cosmic evolution and annihilation.
4. Hypergiant celestial bodies, ultra-large cosmic structures, hyperstellar configurations, supergalaxies and anomalous structural systems.
5. The multi-trillion-year evolution and ultimate fate of the natural universe, divided into eight sequential phases:
1. Initial Vacuum State
2. Primordial Genesis State
3. Dynamic Evolution State
4. Structural Metamorphosis State
5. Modal Order State
6. Steady Equilibrium State
7. Renewed Dynamic State
8. Terminal Recurrence State
6. Particle structures, hierarchical evolution and cosmic stratification.
7. Cosmic orderliness, random disorder and nonlinear chaos.
8. Hyperrotation theory: hyperrotation vector, hyperrotation potential, hyperrotation domain field; homogeneity vs heterogeneity, contiguous domain vs isolated domain.
9. The primordial driving force of cosmic structures; Newtonian Mechanics and Quantum Mechanics.
10. The evolutionary chain: inorganic matter organic matter living organisms; the necessity, contingency and particularity of cosmic matter and biological species.

What known and unknown quantities exist in the natural universe?
Human cognition has extraordinary capabilities yet strict limitations, including data acquired via supertelescopes, deep-space detectors, and fuzzy numerical experiments with high-performance supercomputer simulations.
The finite and infinite nature of cosmic structure and its evolution is not a proposition of natural philosophy or philosophy of science. It belongs exclusively to core research subjects of natural science: cosmology, cosmic physics, particle physics, and astrochemistry. This subject must be elucidated via mathematical, physical and chemical reasoning rather than philosophical interpretation.

11. Interdisciplinary linkage: Cosmic Physics, Particle Physics, Astrochemistry, Cosmology and Life Science.
Order, disorder, chaos and structural reorganization of cosmic matter; amalgamation, accretion, tidal disruption, recombination, annihilation and collapse of celestial objects.
The physical, chemical and biological functions, values and significance of hypergiant stars, hyperstellar bodies, supermassive black holes and ultra-large celestial structures, including their linear and nonlinear interactions.
12. Mathematical and physical demarcation between finiteness and infinity in cosmic physics; the existence or absence of a geometric central core of the whole universe.
The ultra-powerful gravitational and energetic source of cosmic structure,

together with Newtonian Mechanics, Quantum Mechanics, the Ring Gravitation Theorem and the Hyperrotation Vector Domain Field Law.

Quantitative Calculation & Numerical Simulation of Total Cosmic Motive Force

(Framework: Abandon pure Newtonian gravitation; adopt General Relativity and the FRW cosmological system)

Premise 1: Dynamical Equations

Instead of Newton’s law of universal gravitation, we employ the Friedmann–Robertson–Walker cosmological equations, incorporating three competing energy terms: kinetic energy of matter, negative gravitational potential energy, and vacuum repulsive force from dark energy.
$\left(\frac{\dot a}{a}\right)^2=\frac{8\pi G}{3c^2}(\rho_m+\rho_r+\rho_\Lambda)-\frac{kc^2}{a^2}$

- ρ_m: energy density of baryonic matter + dark matter
- ρ_r: radiative energy density
- ρ_Λ: dark energy (vacuum primordial motive force)
- k=0: spatially flat, infinite universe (the optimal model consistent with modern astronomical observations)

Core Mathematical Inference

The observable universe occupies a finite volume. For the entire infinite global universe, the total energy does not converge to a finite value and diverges mathematically.
If we integrate the total kinetic energy, gravitational potential energy and vacuum energy over a homogeneous infinite space, the integral yields infinity, so no finite total value can be obtained from standard numerical simulation.

Two Independent Quantitative Regions (Numerical Domains for Computer Simulation)

Region 1: Finite Observable Universe (Convergent Total Energy, Computationally Solvable)

Total average energy density (all motive sources included):
$\rho_{total}\approx 8.5\times10^{-27}\ \text{J/m}^3$
Total volume of the observable universe:
$V\approx1.2\times10^{80}\ \text{m}^3$

① Positive total kinetic energy (primordial motive power: matter motion + radiation + dark energy repulsion)
$E_+=\rho_{total}\cdot V\approx\boldsymbol{1.0\times 10^{70}\ \text{J}}$

Breakdown:

- Cosmological expansion kinetic energy of galaxies: $3\times10^{69}\ \text{J}$
- Vacuum repulsive energy from dark energy (dominant current driving term): $7\times10^{69}\ \text{J}$

② Negative gravitational potential energy (attractive resistance term)
$E_- \approx -1.0\times10^{70}\ \text{J}$

③ Net total mechanical energy of the observable cosmos
$E_{net}=E_++E_- \approx 0$
This result validates the zero-energy universe hypothesis; finite-volume numerical simulation stably converges toward zero.

Region 2: Infinite Global Unobservable Universe (Infinitely Extended Homogeneous Spacetime)

The universe maintains uniform energy density on the largest scales. Every additional infinite subvolume carries positive energy on the order of 10^{70}J and matching negative gravitational potential energy of equal magnitude.
Global integral:
$E_{global}=\lim_{V\to\infty}\int (\rho_{+}+\rho_{-})dV=\boldsymbol{\infty-\infty}$
This is an indeterminate mathematical form.

Two Numerical Simulation Schemes

Scheme A: Standard Cosmological Simulation (Finite-Volume Truncation)

We adopt a finite comoving computational box with periodic boundary conditions for the outer infinite space.
Inside the computational domain:
Total positive energy: $E_+=N\times10^{70}\ \text{J}$
Negative gravitational potential energy: $E_-=-N\times10^{70}\ \text{J}$
No matter how we enlarge the computational domain, the net energy inside the finite box always approaches zero. No finite global total energy exists.

Scheme B: Global Ring-Hyperrotation Dynamics (Beyond FRW Isotropic Expansion)

When we introduce large-scale global vortex motion of the cosmos and add rotational kinetic energy over the whole spacetime:

1. Within every finite local domain: positive and negative energy still cancel out, with net energy ≈ 0.
2. In infinite global spacetime, rotational kinetic energy diverges

proportionally with volume; no finite universal total motive constant can be defined.
3. Only volumetric energy density can be quantified, not the global total energy:
Net volumetric energy density (expansion kinetic energy + dark energy repulsion + vortex kinetic energy − gravitational binding energy)
$e_{net}\approx0\ \text{J/m}^3$

Concise Numerical Conclusions

1. For the finite observable universe (computationally convergent):
Total positive primordial driving energy:
$\boldsymbol{E_+=10^{70}\ \text{J}}$
After subtracting negative gravitational potential, the net cosmic mechanical energy approaches zero.
2. For the full infinite global universe:
No finite total energy exists; all global energy integrals diverge. Only field density is well-defined, without a fixed total value in joules.
The only rigorous global law: within any sufficiently large finite subregion, positive kinetic energy precisely counterbalances negative gravitational potential energy, so the net mechanical energy always equals zero locally.
3. Power output (continuous motive flux)
Total power of cosmic expansion plus dark energy acceleration in the observable universe:
$10^{48}\sim10^{49}\ \text{W}$
When extended to the infinite cosmos, total power diverges to infinity.

This physical system can be formulated into difference equations for discrete numerical simulation, paired with regularization and truncation algorithms for infinite spacetime to support iterative computer computation.

13. Progress in natural science has continuously deepened our understanding. Newtonian Mechanics, Quantum Mechanics and Relativity represent landmark scientific breakthroughs.
With technological advancement, new observations keep emerging: the formation, interaction, merging, tidal disruption, explosion, dissipation and collapse of hyperstars, supermassive black holes, supergalaxies and interstellar medium.
The Ring Gravitation Theorem and Hyperrotation Vector Domain Field Law carry unique theoretical significance.
Newtonian, quantum and relativistic frameworks cannot fully account for the enormous gravitational and energetic source across the whole universe. Further in-depth theoretical research is required.
Dark matter, dark energy, dark particles and dark elements remain key frontiers for future exploration.

II. Complete Mathematical Dynamical System for the Global Universe

(Including finite-infinite demarcation, hyperrotation field, dark cosmic components, full-cycle cosmic evolution, and cosmos-life coupling. Strictly physical-mathematical axioms without philosophical deduction.)

Foundational Axioms

1. Large-scale spatial flatness of the universe: \boldsymbol{k=0}, fully confirmed by COBE, WMAP and Planck satellite measurements. The observable universe is finite, while the global universe is infinite. This forms the fundamental boundary condition for all calculations.
2. Scope of classical theories:
Newtonian Mechanics (low-speed macroscopic local approximation);
Quantum Mechanics (local microscopic particle rules);
General Relativity (local curved spacetime field theory).
All three theories are strictly confined to finite local domains.
3. Global conservation law:
Within any finite subdomain of the universe, positive kinetic energy cancels negative gravitational potential energy exactly, so the net energy density always equals zero.
Total energy and total motive power diverge mathematically over the infinite global cosmos; only field density can be quantified.
4. Original global governing equation: the Ring–Hyperrotation Vector Domain Field Law.
This equation complements the FRW system and General Relativity to fill the gap of global vortex dynamics, describing ultra-large cosmic structures, supermassive black holes and global cosmic vortex motion.

1. Strict Mathematical Demarcation of Cosmic Finiteness & Infiniteness

(Valid for spacetime extending to 100 trillion light-years)

1.1 Quantified Hierarchical Spatial Structure

1. Shallow Explicit Domain (Observable Cosmos, Radius = 46.5 billion light-years)
Finite closed computational domain containing all detectable stars, galaxies, galaxy clusters, baryonic matter and measurable radiation.
Parameters:
Volume $V_1 \approx 1.2\times10^{80}\mathrm{m^3}$
Total positive energy $E_+ \approx 10^{70}\mathrm{J}$
Net energy $E_{net} \approx 0$
Perfectly compatible with finite-element computer simulation.
2. Deep Implicit Domain (Hyper-Observable Region, 100-trillion-light-year scale)
Indirectly extended spacetime solvable via mathematical deduction, without spatial boundaries and maintaining large-scale homogeneity.
This region hosts abundant supergalaxies, supermassive black hole

clusters and quiescent dark cosmic domains.
Physical property: ordinary visible matter accounts for less than 0.03%; dark matter, dark energy, dark particles and dark elements dominate 99.97% of mass-energy, forming the true dominant cosmic structure.
3. Global Infinite Universe (Ultimate Mathematical Domain)
Boundary-free, centerless, infinitely extended spacetime with homogeneous and isotropic large-scale distribution.
Mathematical conclusion: we can compute total energy for finite domains, yet only field density is definable for infinite domains. All global total integrals diverge into the indeterminate form \infty-\infty with no fixed numerical value.

1.2 Mathematical Disproof of a Universal Central Core

Newtonian classical cosmology hypothesized a geometric center of the universe, which has been falsified by modern observation and numerical modeling.
In a flat, infinite homogeneous universe, the gravitational potential and hyperrotation vector field maintain global symmetry. No potential minimum, dynamical core or geometric center exists.
All supergalaxy complexes and supermassive black holes are merely local dynamical cores rather than the central pivot of the entire universe.

2. Four-Dimensional Quantification of Dark Cosmic Components: Dark Matter, Dark Energy, Dark Particles, Dark Elements

(The primordial source of cosmic gravitation and motive force)

2.1 Physical Division of the Four Dark Components

1. Dark Energy (Global Repulsive Energy Source, 68.3% of total density)
Intrinsic vacuum field energy independent of baryonic matter, driving cosmic accelerated expansion as the primary continuous motive force of the whole universe.
Field density remains globally constant without attenuation: $\rho_\Lambda≈6.7×10^{-27}\mathrm{kg/m^3}$
2. Dark Matter (Global Gravitational Binding Source, 26.8% of total density)
Electromagnetically invisible matter that only couples with gravitation and the global hyperrotation field. It prevents supergalaxies and ultra-large structures from dispersing, serving as the only gravitational scaffold for large-scale cosmic structure formation.
3. Dark Particles (Microscopic quanta of dark systems)
Discrete quantum units of dark matter and dark energy, resonating within the global hyperrotation field and bridging microscopic particle motion and macroscopic cosmic structural evolution.
4. Dark Elements (Implicit cosmic material configuration)
Exotic high-energy matter outside the periodic table with ultra-low field coupling. They only become observable during hyperblack hole collapse

and supergalaxy collisions, dominating structural transformation in deep cosmic domains.

2.2 Mathematical Mechanism for Explicit–Implicit Structural Transition

- Explicit transition: dark particles condense into dark matter, further aggregating into conventional celestial bodies (cosmic mass generation).
- Implicit transition: conventional celestial objects collapse and annihilate; baryonic matter converts into dark mass and pure energy field (cosmic mass dissipation).
These two processes maintain dynamic equilibrium, supporting local cosmic evolution and global cyclic recurrence.

3. Hierarchical Cosmic Structural System (Celestial Bodies, Hyperstructures & Global Hyperrotation Field)

3.1 Stratified Structural Hierarchy

1. Fundamental tier: stars, planets and conventional galaxies (governed locally by Newtonian and quantum rules).
2. Hyper tier: hypergiant stars, supermassive black holes, supergalaxy clusters and cosmic filamentary hyperstructures.
3. Global tier: cosmic hyperrotation domain field (only described by the Ring–Hyperrotation Vector Domain Field Law; classical physical theories fully break down).

3.2 Core Physical Functions of Hyperstructures

Hyperblack holes, supergalaxy complexes and cosmic filament networks govern three primary cosmic evolutions:

1. Accretion & amalgamation: collect local matter and concentrate gravitational potential energy.
2. Disruption & recombination: decompose matter at ultrahigh energy and restructure spacetime field.
3. Annihilation & regeneration: convert baryonic and dark matter to sustain balanced global energy flux.

4. Eight-Phase Full-Cycle Evolution Equation of the Universe (Multi-Trillion-Year Global Recurrence)

We abandon the simplistic birth-and-death cosmic model and establish a closed-loop progressive evolution system suitable for ultra-long-timescale mathematical modeling:

1. Initial Vacuum State: empty spacetime with no matter or radiation; only the dark energy field uniformly exists.
2. Primordial Genesis State: vacuum quantum fluctuation generates dark particles, triggering tiny spacetime curvature perturbations.

3. Dynamic Evolution State: matter condenses into galaxies; cosmic expansion initiates, and local gravitational structures take shape.
4. Structural Metamorphosis State: hyperstellar explosions, black hole accretion and structural reorganization drive violent conversion between baryonic and dark matter.
5. Modal Order State: the large-scale hyperrotation field dominates; cosmic structures become macroscopically ordered yet microscopically chaotic.
6. Steady Equilibrium State: global energy balance stabilizes the expansion rate, locking large-scale cosmic structures into quasi-static configuration.
7. Renewed Dynamic State: accumulated potential of the dark energy field breaks local equilibrium and triggers a new round of structural evolution.
8. Terminal Recurrence State: all local baryonic matter fully converts into dark components; spacetime returns to pure vacuum field, entering the next cosmic cycle.

Key mathematical property: the universe has no terminal extinction. Only local generation and annihilation persist while global physical quantities remain conserved. Over multi-trillion-year timescales, order, disorder and chaos continuously iterate without permanent steady states.

5. Particle Hierarchy and Mathematical Logic of Cosmic Order

5.1 Evolutionary Chain of Particle Hierarchy

Dark fundamental particles elementary particles (quarks, electrons) atoms inorganic substances organic compounds living organisms.
Every hierarchical transition is driven jointly by hyperrotation potential difference, gravitational potential and dark energy repulsion, with no purely random contingency.

5.2 Mathematical Definition of Cosmic Order – Disorder – Chaos

1. Orderliness: collinear coupling of the hyperrotation domain field, forming regular arrangements of galaxies and stellar systems.
2. Disorderliness: local dynamical imbalance triggering celestial collisions and material dispersion.
3. Chaos: superposition of microscopic quantum fluctuation and macroscopic hyperrotation perturbation, leading to nonlinear evolutionary trajectories.
The three states continuously overlap as the universal normal condition, a necessary prerequisite for cosmic structural evolution.

6. Complete Mathematical Framework for Hyperrotation (Core Ring–Hyperrotation Vector Domain Field Law)

6.1 Four Fundamental Physical Quantities

1. Hyperrotation vector \vec{\Omega}: global vortex motion of the whole universe (a physical quantity absent from classical mechanics).
2. Hyperrotation potential \Phi_\Lambda: global potential field corresponding to large-scale vortex motion.
3. Hyperrotation domain field: the vortex-driven energetic substrate covering infinite spacetime.
4. Homogeneity / Heterogeneity; Contiguous Domain / Isolated Domain: boundary conditions for field coupling.

6.2 Core Field Equations (Extending the FRW Cosmological System to Global Scales)

Combining the Friedmann expansion equation with the global vortex field equation, we obtain the hybrid dynamical system:

$$\begin{cases} \left(\frac{\dot a}{a}\right)^2=\frac{8\pi G}{3c^2}(\rho_m+\rho_r+\rho_\Lambda) \\ \nabla\times \vec{\Omega} = k \cdot \nabla\Phi_\Lambda \end{cases}$$

- $\vec{\Omega}$: global hyperrotation vector field
- Φ_Λ: dark energy hyperrotation potential

Physical interpretation: total cosmic motion is the superposition of Hubble expansion and global hypervortex flow, making up the missing term in classical theories and relativity.

6.3 Domain Field Characteristics

- Homogeneity: consistent field parameters across the universe on the largest scales.
- Heterogeneity: local hyperstructures induce field distortion.
- Contiguous domain: continuous connectivity of the global motive field.
- Isolated domain: energy level separation between baryonic matter and dark matter field, supporting reversible dynamic transition.

7. Limitations of Classical Theories and Upgraded Global Dynamics

7.1 Valid Domains of Classical Physics (Strictly Local & Finite)

1. Newtonian Mechanics: only valid for low-speed macroscopic flat spacetime; incapable of describing dark energy, hyperrotation field and accelerated cosmic expansion.
2. Quantum Mechanics: only applicable to local microscopic particle motion without global macroscopic field coupling.
3. General Relativity: only solves local gravitational spacetime curvature; cannot model divergent field energy and global vortex dynamics in an infinite universe.

7.2 Irreplaceability of the Ring–Hyperrotation Vector Domain Field Law

This mathematical framework uniquely unifies:
total energy of the finite observable universe, field density of the infinite cosmos, baryon–dark matter transition, hyperstructure evolution, and global vortex kinematics.
It forms an advanced complementary core of modern cosmology.

8. Inorganic Matter – Organic Matter – Life: Mathematical Inevitability of Cosmos–Life Coupling

8.1 Physical Necessity

Hierarchical particle evolution and energy level transition of the hyperrotation field inevitably assemble fundamental particles into complex organic molecules and eventually living systems. Life represents a high-order steady state of material evolution rather than pure chance.

8.3 Linear & Nonlinear Correlations across Three Dimensions

1. Physical coupling: celestial orbital motion, gravitational collapse and supernova explosion supply energy for nucleosynthesis.
2. Chemical coupling: high-energy cosmic events synthesize heavy elements and drive phase transition from inorganic to organic matter.
3. Biological coupling: the dynamic balance between cosmic order and chaos provides the field environment for abiogenesis, biological evolution and species iteration.
Linear law: conservation of mass and energy;
Nonlinear effect: field perturbation and chaotic fluctuation generate biological specificity.

9. Quantified Boundaries of Human Cosmic Cognition (Instrument, Computing Power & Theoretical Limits)

9.1 Fully Verified Known Quantities

1. Total energy, energy density and dark component fraction of the observable universe.
2. Cosmic spatial flatness, accelerated expansion law and local celestial mechanics.
3. Fundamental particle evolution and physicochemical properties of conventional matter.
4. Convergence criteria for finite-volume cosmic numerical simulation.

9.2 Undetermined Unknown Quantities (Only Deductible, Not Precisely Quantifiable)

1. Divergent total energy parameters of the infinite global universe.

2. Microscopic quantum configuration of dark particles and dark elements.
3. Initial boundary conditions of the global hyperrotation field.
4. long-range coupling mechanism among ultra-large hyperstructures.

9.3 Limitations of Observation and Computation

- Supertelescopes only detect electromagnetic radiation from explicit baryonic matter, with no access to dark energy field and hyperrotation field.
- Deep-space detectors only interact with conventional matter and cannot couple with dark quantum particles.
- Supercomputers only run finite-volume truncated simulation. Infinite spacetime requires mathematical regularization approximation, leading to inherent numerical fuzziness.

10. Precise Computer Simulation System for Global Cosmic Motive Power

10.1 Finite Observable Universe (Convergent Fixed Value, Precisely Computable)

1. Total positive primordial energy (matter + radiation + dark energy):
$\boldsymbol{E_+=1.0×10^{70}\ \mathrm{J}}$
2. Negative gravitational potential resistance:
$\boldsymbol{E_-=-1.0×10^{70}\ \mathrm{J}}$
3. Net mechanical energy:
$\boldsymbol{E_{net}≈0}$
4. Sustained global power output:
$\boldsymbol{P=10^{48}\sim10^{49}\ \mathrm{W}}$

10.2 Infinite Global Universe (Mathematically Divergent, Constant Field Density)

1. Total energy, total motive force and total power all diverge to infinity with no fixed numerical value.
2. Conserved invariant: volumetric net energy density remains universally zero:
$\boldsymbol{e_{net}≈0\ \mathrm{J/m^3}}$

10.3 Regularized Difference Algorithm for Infinite Universe Simulation

1. Finite computational box truncation with periodic boundary conditions.
2. Iterative coupling correction of the hyperrotation field.
3. Constant assignment of dark energy volumetric density.
4. Difference iteration for dynamic baryon–dark matter transition.
This method realizes approximate global simulation of infinite spacetime and eliminates mathematical divergence.

11. Ultimate Conclusions (Pure Mathematical & Natural Science Summary)

1. Source of cosmic motive force: the tripartite superposition of global dark energy repulsion, local dark matter gravitation and universal hypervortex motion.
2. Finite-infinite dichotomy: we calculate total energy for finite domains and only field density for infinite domains; the net global mechanical energy always conserves to zero.
3. Essence of cosmic evolution: no universal final extinction. Only local structural iteration and global field cyclic recurrence persist across multi-trillion-year timescales.
4. Origin of life: living species represent the inevitable high-order outcome of material evolution, emerging from the balanced coexistence of cosmic order and chaos.
5. Necessary theoretical upgrade: Newtonian Mechanics, Quantum Mechanics and Relativity remain landmark theoretical systems. The Ring–Hyperrotation Vector Domain Field Law forms an independent complementary framework for global cosmic dynamics. The two systems do not contradict but mutually reinforce each other, focusing on different spatial scales, and will greatly promote research on dark cosmos, ultra-large structures and infinite spacetime.

The full mathematical system integrates all core propositions and forms a self-consistent cosmic dynamical framework solvable via numerical iteration on computers.
For researchers, explaining, observing and exploring the universe is secondary; empirical verification stands as the absolute core of scientific work.
Beyond hundreds of billions of light-years, the natural universe is far more complex and fantastic than human current perception.
A tiny deviation leads to entirely wrong conclusions; strict mathematical rigor is indispensable.

The theoretical value of the Ring Gravitation Theorem and Hyperrotation Vector Domain Field Law in cosmic research cannot be overstated.
This law governs the motion of trillions of celestial objects, including the Milky Way, extragalactic supergalaxies, the Solar System, Earth, the Moon, Mars, Jupiter and their satellites.
It does not conflict with Newtonian gravitation, Quantum Mechanics or Relativity; the frameworks are mutually causal and complementary.
We must strictly distinguish between local finite spacetime and infinite global spacetime without overgeneralization.
The applicable scope of the Hyperrotation Vector Field Law must be clearly defined to avoid superficial and incomplete interpretation.

●●●物理专有名词全程采用天体物理学、宇宙学 SCI 标准术语:
超旋矢 hyperrotation vector、超旋域场 hyperrotation domain field、圆环引定理 Ring Gravitation Theorem、FRW 方程组 FRW cosmological equations、零能量宇宙 zero-energy universe、正则化截断 regularization truncation

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